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# Fixed-term contracts as screening devices: Causal evidence in a two-tier system

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**Abstract**

The purpose of this dissertation is to access the impact stricter employment protection legislation on the use of fixed-term contracts as a screening device. To achieve this, I first confirm the results found by Centeno and Novo (2012) on the impact of the 2004 labor code reform over excess worker turnover and the share of fixed-term contracts on Portuguese firms, and then explore the link between those indicators and the transition of fixed-term to open-ended contracts. While the link between more stringent employment protection legislation and a higher reliance on fixed term contracts seems clear, the strategy of using fixed-term contracts as a screening device appears to be persistent, and more affected by idiosyncratic factors than external policy changes.

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# 1. Introduction

The role of fixed term contracts in a two-tier labor market is twofold: to provide a more flexible instrument for firms to adjust employment level, and to be used as a screening device to find better worker-firm matches. When the employment protection gap between contract types is wide, fixed-term contracts end up carrying the burden of the higher protection conferred to open-ended contracts. As worker churning among fixed-term contracts increases and firms refrain from converting fixed term to open ended contracts, the search and matching process becomes more inefficient, with negative effects for productivity.

Using empirical evidence from Portugal, Centeno and Novo (2012) study the impact of the 2004 labor code reform which introduced more stringent legislation regarding dismissals of open-ended contracts for firms with 11 to 20 workers, by measuring the effects on excess worker turnover rates for both types of contracts, and the share of fixed-term workers on Portuguese firms. This quasi-experiment permitted the authors to confirm with empirical evidence the idea that a wider gap in employment protection legislation leads to higher rates of excess worker turnover among fixed-term contracts. Another consequence of a wider protection gap is the lower chance of a fixed-term contract to be converted into an open-ended contract, as firms avoid the risk associated with commitment to a contract with high dismissal costs.

Drawing from the same causal evidence, the purpose of this MSc Thesis is to access the impact stricter employment protection legislation on the use of fixed-term contracts as a screening device. To achieve this, I first confirm the results found by Centeno and Novo (2012) on the impact of the reform over excess worker turnover and the share of fixed-term contracts on Portuguese firms, and then explore the link between those indicators and the transition of fixed-term to open-ended contracts. While the link between more stringent employment protection legislation and a higher reliance on fixed term contracts seems clear, the strategy of using fixed-term contracts as a screening device appears to be more resilient, and seems to be more affected by idiosyncratic factors than external policy changes.

This MSc Thesis is organized as follows: chapter 2 presents the literature review, from job and worker flows to institutional reforms in the context of two-tier systems and the role of fixed-term contracts; chapter 3 provides the background of the institutional reform and describes the dataset used; chapter 4 explains the concepts and methodology used; chapter 5 presents the stylized facts and summary statistics of the Portuguese labor market; chapter 6 addresses the main questions; and chapter 7 concludes.

# 2. Literature Review

## 2.1 Job and worker flows

The labor market can be described as a continuous search and matching process, where workers and firms search for the best possible match under imperfect information. In the form of information asymmetry, as Gibbons and Katz (1991) discuss it, current employers are better informed about the skills of their workers than prospective employers. When a firm decides to lay-off workers, it signals the market that those workers in particular might not be the best matches. However, when a plant is closed, the market does not infer it is due to the worker's characteristics, but as a reaction of the firm to the market circumstances. Prospective employers will offer higher wages to workers displaced by plant closings than those displaced by layoffs, and the duration of the unemployment spell will also be longer for the later rather than the former. Another form of information uncertainty comes from match heterogeneity, where the quality of a match can not be perfectly assessed ex-ante, and it only becomes revealed as job tenure increases. This idea is developed by Jovanovic (1979), where the author presents a matching model where each worker and firm has a nondegenerate distribution of productivities across different jobs, and the problem is to optimally assign worker to be better suited jobs. As job tenure increases, the productivity of a match becomes better known, which can be thought as an "experience good". Information uncertainty from the worker's perspective is developed by Topel and Ward (1991). Using longitudinal data from the United States, they find wage gains at job changes to account for at least a third of early-career wage growth, as the worker does not know the nature of the job or to correctly evaluate his

own skills, and only through trial he can fully access the best possible match. This strand of the literature addresses the question of why the simultaneity of hiring and separations exists, and it provides the theoretical background to further explore the dynamic relation between job and worker flows.

We have now two branches in the literature, one focusing on worker flows and another on job flows, which follow different but complementary approaches. On the side of worker flows, Mortensen and Pissarides (1994), building upon the analyses of Diamond (1982), use a matching model to obtain endogenous job creation and job destruction processes and study their properties. They find different behaviors for job creation and job destruction, with the later being more volatile, as negative shocks alter the search behavior of worker and firms and fewer favorable matches are found. Their search and matching model has become the basis for the literature in this field. Regarding job flows, the book "Job Creation and Destruction" by Davis, Haltiwanger and Schuh (1996) has become the standard reference in the literature. It provides the definitions for key concepts such as gross job creation, destruction and reallocation, net job creation and excess worker turnover, explores differences within and across industries, relates job and worker flows to unemployment and business cycles, and discusses economic policy implications. The book compiles the main findings of the literature at the date, including but not limited to: Davis and Haltiwanger (1990) previous work on job creation and destruction, finding enormous dispersion in establishments' employment growth rates, confirming Leonard (1987), and Dune, Roberts and Samuelson (1989) on the conclusion that within industry variations are larger than across industry variations; the previously mentioned Gibbons and Katz (1991) and Jovanovic (1979) on the importance of information asymmetry; and Diamond (1981) and Mortensen and Pissarides (1994) for their tremendous contribution in the theory of matching models.

## 2.2 Cross-country comparisons

Acknowledging the different strains in the literature Abowd, Corbel, and Kramarz (1999) contribute with a characterization of job and worker flows, using data from a sample of French establishments which permits the distinction between the two types of flows. The authors find that adjustment comes primarily from reducing entry and

not by increasing separations; two-thirds of all hires are on short-term contracts, and approximately one third of these are converted to long-term contracts at their termination. These findings are particularly important in the analysis of two-tiered labor markets[1], in which employment protection legislation for permanent contracts is more stringent than for temporary contracts. Moreover, the conversion rate of one third of fixed-term contracts into permanent contracts seems to indicate the former are used as a screening device to access the quality of the worker-firm match. This idea will be later developed, but first it is useful to compare the findings of different authors for a different setting.

Searching for a synthesis between the two branches of literature, Burgess, Lane and Stevens (2000) explore the relation between worker and job flows using empirical data of Maryland quarterly wage reports, which contains data on individual employees. The authors find churning flows[2], worker flows in excess of those strictly necessary to achieve a given level of employment, to be high, pervasive and highly persistent within employers. They also find a link between churning flows and employment which motivates their following paper Burgess, Lane and Stevens (2001). Using empirical evidence, they show that on average, expanding increase their hiring rate refrain separations and contracting firms adjust by increasing their separation rate while slightly reducing hiring. The reason why all firms engage in worker churning can be found in match heterogeneity, and the attempt to change either the composition of the workforce or the quality of the matches. In contrast with Abowd et al. (1999), who found that French firms primarily adjust entry rather than exit rates, Burgess et al. (2001), find that American firms adjust to employment falls by increasing separations and reducing hiring, and also expanding firms, register high churning rates from quits, and separations as the firm tries to improve its workforce. They suggest the difference might be linked to the employment protection legislation between the two countries.

[1] Two-tier systems are characterized by the existence of two groups of workers with distinct employment conditions, ranging from salary, benefits and job stability. This feature may arise from national legislation, which typically confers higher employment protection to permanent over temporary contracts, or from collective agreements which favor incumbents over entrants.

[2] Churning flows or excess worker turnover refer to the same concept, i.e. the worker flows in excess of job flows. In the literature review I refer to the concepts according to the terms chosen by the authors, although I will refer to this concept as excess worker turnover for the remainder of this dissertation.

On the subject of cross-country comparison, a recent paper by Bassanini (2010) utilizes harmonized data from select group of OECD countries. Bassanini finds idiosyncratic firm characteristics such as industry, age, and size, to be a key factor in explaining job and worker flows in line with previous literature, and that both job and worker flows vary significantly across-countries, contrasting with some of the literature which defends that while worker flows do differ across-countries, job-flows do not. Excess job reallocation, the number of jobs created and destroyed within an industry in relation to net employment change, is at or above 25% in countries with flexible labor markets or a large informal sector, such as the USA, the UK, Brazil and Mexico, while in continental European countries that number is below 15%. However, worker churning seems to be invariant across countries, as job and worker flows tend to be of similar magnitude within countries. To quote a phrase from the article "Country effects, nonetheless, explain about one-third of the cross-country/cross-industry variation of worker flows, no matter what measure is considered, suggesting that policy and institutions play an important role in shaping the cross-country distribution of worker flows." This leads us to further investigate the role of institutions.

## 2.3 Institutional reforms and the role of fixed-term contracts

To provide a theoretical background to a growing body of empirical studies regarding institutional reforms, Boeri (2010) proposes to critically review the recent empirical literature. The author begins by noting that most reforms over the past 20 years are only partial reforms that affect a specific segment of the labor market, creating two-tier regimes and long lasting asymmetries. Boeri extends an equilibrium search model developed by Dale Mortensen and Christopher Pissarides[3], in order to consider two-tier regimes in the framework of employment protection, unemployment benefits, active labor market policies and employment conditional incentives. On the subject of employment protection legislation in two-tier markets, Boeri suggests that employment protection deriving from stringent legislation can be offset by legislation restricting wage setting, thus preventing firms to adapt and forcing layoffs that could

[3] Mortensen, D. and Pissarides, C. (1999), New Developments in Models of Search in the Labor Market, Handbook of Labor Economics, vol. 3b, 2567-2627

otherwise be avoided with a salary reduction. To understand these interactions regarding within country EPL reforms, recent studies have adopted a double differences approach, by comparing the before and after periods and segments affected and unaffected by the legislation. Two-tier reforms which affect one type of contract only, are ideal to study in this respect, as they induce both time-series variations as well as within-country variations. Exploring the effects of a quasi-experiment in the context of two-tier labor markets is the object of this thesis and it prompts us to further explore the recent literature.

The reaction of the French and Spanish labor markets to the financial and economic crisis in 2007-08, assumes particular relevance as the institutional framework of both countries can be described as a two-tiered labor markets, and yet the response was very different. As the unemployment in France went from 8% in 2007 to 10% in 2009, unemployment in Spain rose from a historically low 8% in 2007 to 19% in 2009. Bentolila, Cahuc, Dolado and Le Barbachon (2010) find one possible answer might be in the larger gap of dismissal costs between permanent and temporary contracts, and in the less restrictive legislation regarding the later in Spain. The authors use a calibrated search and matching model following previous work by Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002), which in turn were based on Mortenssen and Pissarides (1994), to explore how the different employment protection legislations affected the rise of unemployment on both countries, and how 45% of the surge in unemployment could have been avoided, had Spain adopted the French employment protection legislation. If two-tier systems are the consequence of stringent protection legislation of permanent over temporary contracts, it is worth understanding why firms choose one or another type of contract. A recent paper by Cahuc, Charlot and Malherbet (2012) addresses this question by using a search and matching model with productivity shocks in the framework of Mortensen and Pissarides (1994), where production opportunities become unproductive at a constant rate. The problem for firms is to choose the contract type which provides the higher surplus, knowing that temporary contracts are not renegotiable and have a fixed duration, and that permanent contracts have a probationary period, can be renegotiated, and terminated for a cost. The idea that temporary contracts are used as a screening device depends on the relation between these variables: the duration of

the probationary period, the costs of hiring, and the costs of firing. After the moment of hiring, temporary contracts can be renewed or converted to a permanent contract if the productivity of the job remains constant. In both models, Bentolila et al. (2010) and Cahuc et al. (2012), the substitutability between contracts is a crucial assumption. This theoretical background provides some insight on why firms choose fixed-term contracts as a screening device or not.

To further study the role of fixed-term contracts as a screening device, Portugal and Varejão (2010) use firm-level data (Social Security Records) and matched employer-employee data (Personnel Records) of Portuguese firms to address four questions: who hires temporary workers; who gets a temporary contract; who promotes from temporary to permanent contracts; and, who is promoted to a permanent contract after being hired on a temporary contract. At the hiring stage, firms with higher human capital intensity have lower shares of temporary contracts, and younger workers have a higher chance of being offered a temporary contract. The choice of offering a temporary contract heavily depends on the costs of forming a bad match. For positions of higher responsibility, firms invest more in the screening process and hire on permanent contracts, because the risk of committing errors at the higher levels surpasses the initial investment on the screening process. Temporary contracts are offered at lower skill levels, and to younger workers, as the risk of forming a bad match is not as high, and skill can be better accessed through experience. At the promotion stage, the profile of firms more likely to promote are also the ones that rely more heavily on temporary contracts. Those are the firms that follow a low cost hiring strategy, for reasons described above, or firms that used temporary contracts to increase production during an uncertain duration, or firms that invest in training and use temporary contracts to decide who to offer a permanent contract at the end of training. The authors conclude finding these results to be consistent with previous research for other continental European countries, but also for the US, with very employment legislation, which means this research, has a wider scope than could be expected.

Following the thread of labor reforms in the context of two-tier market systems, Centeno and Novo (2012) provide causal evidence on the relation between open-ended and fixed-term contracts with respect to excess worker turnover. Firms

with a higher share of fixed-term contracts exhibit higher rates of excess worker turnover, as fixed-term contracts are temporary, and dismissal costs are lower. The institutional change is the 2004 labor code reform, which introduced more stringent legislation regarding dismissals of open-ended contracts in firms with 11 to 20 workers, thus increasing the implicit firing costs on open-ended contracts for a particular subset of firms. This quasi-experiment permitted the authors to confirm with empirical evidence the idea that a wider gap in EPL leads to an increased reliance on fixed-term contracts. Another consequence of a wider protection gap is the lower conversion rate from fixed-term to open-ended contracts, as predicted by Boeri (2010) and confirmed by Centeno and Novo (2012) for this particular setting.

# 3. Portugal and the 2004 Labor Code Reform

## 3.1 Background

In 2003 Portugal had the highest overall strictness of employment protection legislation (EPL) among OECD member countries[4], especially due to the protection of permanent workers against individual dismissals. The strictness of EPL on open-ended contracts was partially counter balanced by relatively more flexible fixed-term contracts. Introduced in 1976, fixed-term contracts were meant to be used for short duration projects or to face temporary higher demand, without replacing permanent contract for permanent positions. Over time fixed-term contracts became increasingly relevant in the Portuguese economy, with the share of fixed-term contracts accounting for 17.6% on average between 1995 and 2003 (one of the highest shares of the EU15 in 2003, second only to Spain) and reaching to 26.5% in 2008, which can be attributed to the higher flexibility provided by fixed-term contracts. Although EPL concerning collective dismissals on open-ended contracts became less stringent after a law change from May 1989, studied by Martins (2009), the gap remained. Contrary to most high EPL countries which have strict regulation on fixed-term contracts, in Portugal fixed-

[4] OECD Employment Outlook 2004, Chapter 2 Employment Protection Regulation and Labour Market Performance

term contracts are more flexible[5], and that makes Portugal a unique case of a two-tier labor market.

The 2004 labor code reform[6] introduced procedural dismissal costs for open-ended contracts, for firms with 11 to 20 workers, which were until then exempt from such requirements. These procedural costs include written procedures, witness interviews, workers councils, and the union if the worker is a union delegate. This means procedural costs are non-trivial, especially for small firms which may lack the means for such legal action, while fixed-term contracts have no cost at expiration.

### 3.2 Data

The data ('Quadros de Pessoal') is a matched employer-employee longitudinal dataset ('Personnel Records') collected on an annual basis, which contains information on all wage earners in Portugal, excluding independent workers and civil servants. The data is collected since 1985, but only since 2002 we have information on each worker's contract type. From 2002 to 2008, the average number of workers per year is around 2.4 million and the number of firms 350 thousand. Since this is yearly data, all hires and separations that occur between years are not reported. This data has been extensively used, including in the aforementioned studies by Martins (2009), Portugal and Varejão (2010), Centeno and Novo (2012), and a detailed description of the dataset can be found in Cabral and Mata (2003). Worth of note is the fact that during the time period 2002-2008 there were adjustments to identification of workers, particularly in larger firms, but as this study will focus on the 11 to 100 workers firms, it is hoped this discrepancies will be negligible.

[5] See Blanchard and Portugal (2001) for more on the specific nature the Portuguese labor market
[6] The law (Decreto-Lei 99/2003 ) entered into force on December 1st 2003.

# 4. Methodology

## 4.1 Concepts

As the definitions established by Davis, Haltiwanger and Schuh (1996) became standard in the literature, we find slight differences in how formulas are presented, and different ways of calculating the same concepts, which in turn can also have different names according to each author. In order to clarify the concepts used my thesis, I will first present and then explain each formula.

Job Creation and Job Destruction Rates

Starting with the concepts of gross job creation and job destruction, they refer to the total creation of jobs by expanding firms, or destruction by contracting firms. The formulae for these calculations are as follows:

Gross job creation:

$$C_{f,t} = Jobs_{f,t} - Jobs_{f,t-1} \in S^{+}$$

Gross job destruction:

$$D_{f,t} = |Jobs_{f,t} - Jobs_{f,t-1}| \in S^{-}$$

Where f denotes firms, t represents any given year, 'Jobs' stands for the number employees at a given year, and S with the superscripts + and – indicate if the firm belongs to the subset of expanding or contracting firms. These numbers can be expressed as rates when divided by the average employment size of the subset calculated:

$$A_{f,t} = 0.5 * \left(Jobs_{f,t} + Jobs_{f,t-1}\right)$$

Job creation and job destruction rates can also be defined as rates:

$$JC_{f,t} = \frac{C_{f,t}}{A_{f,t}} \qquad JD_{f,t} = \frac{D_{f,t}}{A_{f,t}}$$

Finally to obtain the yearly rates:

$$JCR_t = \frac{\sum_{i=t}^{n} JC_{f,t}}{n} \qquad JDR_t = \frac{\sum_{i=t}^{n} JD_{f,t}}{n}$$

While trivial from a mathematical standpoint, this clarification is crucial, because if we interpret job creation as the aggregate number of jobs created by expanding firms, and obtain the rate dividing by the average employment in the subset, we are calculating very different things. It is the difference between the economy job creation rate, and the average of the firm's individual job creation rates. As this is completely a firm level based analysis, I will only be interested in the later.

Hiring and Separation Rates

Regarding hiring and separation rates, they are calculated by the sum of all hires or separations, in a given firm in a given year, over the average employment between two consecutive years. A worker is considered as hired if he or she was not employed at firm *f* at time *t*-1. A worker is considered as a separated[7] if he or she was employed at firm *f* at time *t-1* but not at time *t*. If a firm no longer exists at time *t*, because it closed between *t-1* and *t*, the employees at *t-1* are considered as separations in period *t* even though they may be employed at another firm at time *t*. The hiring and separation rates can be thus be written as:

Hiring rate:

$$HR_{f,t} = \frac{H_{f,t}}{A_{f,t}}$$

Separation rate:

$$SR_{f,t} = \frac{S_{f,t}}{A_{f,t}}$$

The yearly rates are calculated by taking the simple average of all firms at year *t*.

Excess Worker Turnover

Excess worker turnover (EWT) measures the number of workers that were hired, or that separated, in excess of those strictly necessary to achieve the desired level of employment. When the number of hires and separations (worker flows) that occurs in a firm in a given year exceeds the number of jobs created or destroyed during that

[7] A separation can be one of 4 cases: voluntary separation, involuntary separation, retirement, and death. From Portugal and Varejão (2010): "For the universe of Portuguese firms with at least 100 employees, the voluntary quit rate of workers with an open-ended contract is 5.5 percent. Exits into retirement and worker' deaths account for 8.3 and 1.6 respectively, of the total number of separations of workers with such contracts."

year by that firm (job flows), the percentage by which the worker flows exceed the job flows is called excess worker turnover. This measure can be calculated from the hiring and separation rates described for before. One important concept is that of net employment change (NEC) which is the difference between hires and separations. It can be written as follows:

If,

$$NEC_{f,t} = HR_{f,t} - SR_{f,t}$$

Then,

$$EWT_{f,t} = HR_{f,t} + SR_{f,t} - \left|NEC_{f,t}\right|$$

This can be written as:

$$EWT_{f,t} = \frac{H_{f,t} + S_{f,t} - \left|H_{f,t} - S_{f,t}\right|}{A_{f,t}}$$

The formula implies that if either $H_{f,t}$ or $S_{f,t}$ is zero $EWT_{f,t}$ will be zero. If the number of hires or separations is positive, it will necessarily correspond to the employment variation. The other observation is that the maximum value $EWT_{f,t}$ can take is 2. The maximum value of $EWT_{f,t}$ is reached if: 1) the number of hires and separations are equal, which implies no variation in job flows; and 2), if the number of hires and separations corresponds to the number of jobs, which is only the case if the entire workforce is replaced during the year. When calculating EWT for one type of contract only, all variables must be restricted to that type of contract only.

Contract Conversion Rate

Contract conversion rate (CCR) is the ratio between the sum of all workers on open-ended contracts that were working in the same firm on a fixed-term contract the previous year, over average number of workers on fixed-term contracts between years *t-1* and *t*. It can be written as:

$$CCR_{f,t} = \frac{\sum Conv_{f,t}}{A_{f,t}}$$

Where *Conv* is a binary outcome which takes value 1 when a worker with a open-ended contract had a fixed-term contract the previous year. CCR can take values between zero and two. It takes the value zero when the numerator is zero, and the value 2 when all fixed-term contracts from the previous year have been converted and the firm did not hire any new workers on fixed-term contracts. It is the case of the firm that had 2 workers on fixed-term contracts, converted both to open-ended contracts, and the average

## 4.2 Econometrics method

Difference in differences has become the preferred method to study the impact of policy changes when panel data is available, because of the ability to isolate the effect of a given treatment over a treatment group, by comparing the before and after periods, and measuring the results against a similar control group for counterfactual analysis. Whereas a within effects estimation, would compare the before and after periods within the treatment group, and a between effect estimation would compare the treatment and control groups, the difference in differences estimation permits the combination of the two, by measuring the post and after treatment effects between the two groups. While the definition of the treatment group is a premise, selecting the control group requires greater care as it may decisively affect the conclusions. The control group should be as similar as possible to the treatment group, at least so we can assume that in the absence of treatment the differences between groups would remain the same over time. When available, control variables can be used to obtain a more accurate estimation. The standard difference in differences model is the following:

$$y_{ist} = \beta_t + \gamma_s + \delta D_{ist} + \varepsilon_{ist}$$

Where $y_{ist}$ is the independent variable, for individual *i* in state *s* at time *t*, $\beta_t$ is the *after* dummy, $\gamma_s$ is the *treatment* dummy, $\delta D_{ist}$ is the *after*treatment* dummy, and $\varepsilon_{ist}$ is the error term. Additionally the model may include a vector $X_{it}$ to control for individual characteristics.

Given the purpose of this thesis is to study the impact of stricter EPL on a subset of firms, the difference in difference approach seems adequate. The treatment is the introduction of higher dismissal procedural costs, the before period the years of 2002 and 2003, and the after period the years from 2004 to 2008. The treatment group is constituted by the firms with 11 to 20 workers, and the control group is constituted by the firms with 21 to 100 workers. This control group has roughly the same size of firms as the treatment group, and shares the same institutional framework. Firms are assigned to treatment and control groups on a period-by-period basis. In chapter 6.3 alternative treatment assignments and control groups are tested.

# 5. The Portuguese labor market.

## 5.1 Stylized facts

In this section the main dynamics of the Portuguese labor market are characterized, with particular attention to the subset of firms with 11 to 100 workers and the relation between both contract types.

Beginning with a brief summary of worker and job flows, Table 1 presents the yearly average job creation and destruction for all firms, in comparison to the yearly hiring and separation rates. This table considers only the continuing firms in the economy. The results for the entire 2002-2008 period are similar to those calculated by Centeno and Novo (2012), which in turn consistent with stylized facts in the literature, namely the correlation between job and worker flows. While the magnitude of flows can be different across countries, the ratio of worker flows to jobs flows tends to be similar, as Bassanini (2010) finds comparing a set of OECD countries as mentioned in the literature review.

Table 1: Annual job and worker flows in Portugal

| | Job Creation (1) | Hiring (2) | Job Destruction (3) | Separation (4) | Hiring/ JC (5)=(2)/(1) | Separation/ JD (6)=(4)/(3) |
|---|---|---|---|---|---|---|
| 2002-2003 | 13,2 | 28,2 | 12,7 | 27,8 | 2,1 | 2,2 |
| 2003-2004 | 13,3 | 30,5 | 11,5 | 28,7 | 2,3 | 2,5 |
| 2004-2005 | 14,1 | 30,7 | 10,4 | 26,9 | 2,2 | 2,6 |
| 2005-2006 | 11,2 | 23,5 | 11,3 | 23,6 | 2,1 | 2,1 |
| 2006-2007 | 12,0 | 24,1 | 10,4 | 22,4 | 2,0 | 2,2 |
| 2007-2008 | 11,1 | 23,4 | 10,9 | 23,2 | 2,1 | 2,1 |
| Total (2002-2008) | 12,5 | 26,7 | 11,2 | 25,4 | 2,1 | 2,3 |

Source: Quadros de Pessoal, 2002-2008

Higher hiring rates than job creation rates implies that more workers are hired than those strictly needed to fill the job vacancies. The same is true for separation rates and job closings. This is known in the literature as excess worker turnover, and it measures the reallocation of workers to jobs. Higher turnover rates are a sign of lower job stability, but it also means more worker-firm matches are being tested and potentially it can generate more productive matches. One indicator that these productive matches are being created is the contract conversion rate, which measures the rate at which fixed-term contracts are converted to open-ended contracts. As both expanding and contracting firms are simultaneously hiring, separating and promoting workers, it is useful to have a global outlook. Table 2 presents the average excess worker turnover and contract conversion rates for both the treatment and the control group and for the entire observation period. Columns 1 and 1' report firms with net job creation, columns 2 and 2' report firms with stable employment, and columns 3 and 3' firms with net job destruction, and the category is defined by the firm's situation at the current year, meaning the same firm can be in all 3 column groups if during the time period it experienced increasing, decreasing and stable employment. Table 2 considers continuing firms only.

Table 2: excess worker turnover and contract conversion rates
by treatment and control groups, 2002-2008

| | Net job creation | | Firms with Stable employment | | Net job destruction | |
|---|---|---|---|---|---|---|
| Firm size | EWT | CCR | EWT | CCR | EWT | CCR |
| | (1) | (1') | (2) | (2') | (3) | (3') |
| [11, 20] | 33,5 | 16,5 | 36,6 | 19,5 | 31,9 | 18,1 |
| [21, 100] | 36,1 | 17,4 | 37,9 | 20,0 | 35,4 | 19,5 |
| Difference | 2,5 | 0,9 | 1,3 | 0,4 | 3,5 | 1,3 |
| Employment | 337.553 | | 64.463 | | 269.909 | |

Source: Quadros de Pessoal, 2002-2008.
EWT: Excess worker turnover
CCR: Contract conversion rates

On average 50% of all employment is on expanding firms, 40% on contracting firms, and only 10% in firms with stable employment. The magnitude of excess worker turnover is high for firms in all groups[8], but perhaps the most important results comes from the fact that larger firms report generally higher rates of both excess worker turnover and contract conversion rates. This is consistent with the findings by Davis et al. (1996) who found job and worker flows to be highly correlated with firm size. The reasoning is that larger firms have more room to adjust employment and actively seek better matches, so there is a higher frequency of simultaneous hires and separations, while smaller contracting firms refrain from hiring and expanding firms avoid separations, because the costs of hiring and separations do not outweigh the benefits of worker reallocation. For the contract conversion rates we find that firms increasing employment show lower rates, which derive from the fact that those firms are hiring more workers, and the conversion rates are calculated over the average number o workers on fixed-term contracts. Still, the difference in magnitudes between the two groups is relatively small, and that means these groups share roughly the same characteristics and are comparable.

A link between excess worker turnover and contract conversion rates can be found in survival and conversion probabilities. The longer a match survives the more stable the worker-firm match is, and in an economy with high survival probabilities worker turnover is probably low. On the other hand, contract conversion rates tell us something about how excess worker turnover on fixed-term contracts is being used, which has important implications for the economy. On this subject Nagypál (2001) finds that if fixed-term contracts are used as a buffer stock, allowing firms to adjust to shocks more easily, it is efficient in the short run and avoids labor hoarding, but as it reduces job stability firms do not capitalize on match specific learning-by-doing. When firms use fixed-term contracts as a screening device, they learn more about match quality which translates to better growth perspectives in the long run.

To find more about this relation, table 3 presents the four-year match survival probabilities for all contracts in columns (1) and (1'), the four-year match survival probabilities for fixed-term contracts that did not convert to open ended contracts in

[8] The magnitude of EWT for firms with stable employment should be clearly lower, but the results are influenced by discrepancies in the data which can not be avoided.

columns (2) and (2'), and the four-year match survival probabilities for fixed-term contracts that did convert to open ended contracts in columns (3) and (3'). The years 2002 and 2004 are considered as the base year, representing the before and after periods. The base year includes all matches verified in that year regardless of worker tenure. Only firms with 11 to 100 workers at the base year were considered.

Table 3: Duration of matches by contract type

| | Survival rates of all matches | | Fixed-term contracts | | | |
|---|---|---|---|---|---|---|
| | | | Still fixed-term | | Converted to open-ended | |
| | 2002 matches | 2004 matches | 2002 matches | 2004 matches | 2002 matches | 2004 matches |
| Year: | (1) | (1') | (2) | (2') | (3) | (3') |
| t=1 | 61,3 | 68,2 | 37,5 | 45,4 | 13,0 | 11,7 |
| t=2 | 52,0 | 57,8 | 21,7 | 27,2 | 17,7 | 17,7 |
| t=3 | 48,1 | 51,1 | 14,6 | 18,4 | 20,3 | 19,0 |
| t=4 | 43,0 | 44,7 | 10,0 | 13,3 | 20,4 | 18,6 |
| Average: | 51,1 | 55,4 | 21,0 | 26,1 | 17,9 | 16,8 |

Source: *Quadros de Pessoal*, 2002-2008.
Notes: One match is a worker-firm pair. The 2002 and 2004 matches are the sum of all worker-firm pairs registred in that year. The table presents the percentage of workers at time t who were working on the same firm at the base year 2002 or 2004.

The results suggest the differences found between 2002 and 2004 are worth pursuing. From columns (1) and (1') we find that, while the survival probability of the 2004 matches is higher during the first two years, it converges to a point close to 40%, which indicates the existence of a stable set of worker-firm matches that is resilient to changes[9]. From columns (2) and (2') we find an overall prevalence of fixed-term contracts when 2004 is the base year. The longer duration of fixed-term contracts suggests that firms have opted for fixed-term instead of open-ended contracts, either by hiring more workers on fixed-term contracts, or by extending the contract duration

[9] These results are in line with the ones presented by Centeno and Novo (2012) and also with those found by Burgess et al. (2000) using data from the U.S. manufacturing and non-manufacturing.

of existing fixed-term contracts[10]. The substitution of contracts as a reaction to more stringent EPL is an expected result, as the models of Bentolila et al. (2010) and Cahuc et al. (2012) predict. The degree of substitutability between contracts can be found in higher excess worker turnover rates which will be tested further. Comparing columns (3) and (3'), we find lower ratios of matches converted to open-ended contracts from 2004, as expected, although the difference is relatively small.

## 5.2 Summary statistics

To understand why, it is useful to collect and summarize the firm-level data for the sample of treatment and control firms, including key variables as the share of fixed-term contracts, excess worker turnover and contract conversion rates. Table 4 was constructed for this purpose. The average share of fixed-term contracts is 26%, global excess worker turnover rates are high near 32%, mostly due to the presence of fixed-term contracts, and the contract conversion rate is near 17%. The sample contains a total of 4.394.161 worker-firm matches, distributed among 48.877 unique firms[11]. The treatment group is slightly larger than the control group, accounting for 55% of the number of observations, and the number of observations is larger in the after period, as the period 2004-2008 contains more observations than the 2002-2003 period. Firm workforce composition is taken from the simple average of the individual firm's workforce composition.

[10] In 2003 fixed-term contracts could last up to 6 years. The new law reduced the maximum contract duration to 3 years.

[11] Firms are counted only the first year they appear in the dataset. The number of observations is the firm-year pair since this is longitudinal data.

Table 4: Summary statistics: Firm-level data, 2002-2008

| Variable (firm level) | Mean | Std. Deviation |
|---|---|---|
| Fixed-term contracts per firm (in %) | 26,2 | 28,54 |
| Total excess worker turnover (in %) | 31,8 | 33,08 |
| Excess worker turnover by contract type: | | |
| Fixed-term contract | 36,1 | 45,81 |
| Open-ended contract | 21,6 | 31,72 |
| Contract conversion rate | 16,7 | 38,69 |
| | | |
| (Log) base wage | 64,4 | 0,34 |
| Blue-collar workers (in %) | 29,7 | 32,59 |
| Educational level, percentage of workers with: | | |
| 9 or less years | 71,3 | 27,66 |
| 10-12 years | 18,2 | 18,71 |
| College | 10,4 | 17,00 |
| Females (in %) | 42,4 | 32,49 |
| Immigrants (in %) | 4,8 | 12,95 |
| Manufacturing and Utilities | 44,9 | 49,74 |
| Commerce and Services | 38,5 | 48,66 |
| Firm size (average number of workers) | 25,7 | 17,85 |
| Firm age ( in years) | 20,7 | 27,84 |
| Workforce average age (in years) | 38,0 | 5,26 |
| Workforce average tenure (in months) | 85,8 | 60,60 |
| | | |
| Worker firm matches (2003-2008) | 4.394.161 | |
| Number of firms | 48.877 | |
| Number of observations (firm x year) | | |
| Before | | |
| Treatment | 14.033 | |
| Control | 11.259 | |
| After | | |
| Treatment | 80.823 | |
| Control | 64.978 | |
| Total | 171.093 | |

Source: Quadros de Pessoal, 2002-2008. The before period corresponds to 2002-2003, and the after period to 2004-2008. Each period a treatment firm has 11 to 20 workers and a control firm has 21 to 100 workers.

# 6. Empirical assessment of the 2004 Labor Code Reform

The previous chapters have set up the theoretical framework, provided the background of the 2004 Labor Code Reform, characterized the job and worker flows in Portugal, and presented stylized facts for the sample of firms directly affected by the reform in comparison with its control group. This chapter follows a difference-in-differences approach to find the effect of the reform on both the treatment and control groups, particularly on the use of fixed-term contracts as a screening device.

## 6.1 Unconditional difference-in-differences

Following the approach from table 3, match survival and conversion rates, I construct table 5 to isolate the treatment and control groups and to identify the effect of the policy change on the treatment group. The before period includes all firms in 2002 and 2003 with 11 to 100 workers, and the after period all firms with 11 to 100 workers in 2004 and 2005 (table 5). The survival and conversion rates are calculated as in table 3, with the difference that for each period there are two base years. Considering two base years partially mitigates the bias that comes from considering only one year as representative of the entire period[12]. The two-year survival window comes from the fact that most fixed-term contracts are terminated or converted within two-years.

The results are consistent with table 3 and in line with the literature regarding EPL and two-tier models. The increase in procedural firing costs for open-ended contracts led firms to increase the share of workers on fixed-term contracts as the comparison between columns (2) and (2') indicates. Moreover, this effect is positive for the treatment group in the after period, which means the group of firms directly targeted by the policy change had a stronger reaction than the control group for the same period, as would be expected. In columns (3) and (3') we see that, while the control group has kept the share of fixed to open-ended contracts almost unchanged, the treatment group has reduced that share by 1.3 percent points. Finally for columns (1) and (1'), while the job stability seems to have increased in the after period, it

[12] There might be year specific unobserved factors that influence the results. By taking into account more than one year that effect is partially mitigated.

increased less for the treatment group, which may come from the higher reliance on fixed-term contracts and lower conversion rates.

Table 5: Duration of macthes: Unconditional difference-in-differences

| | Two-year survival probability | | Two-year probability that a fixed-term is still fixed-term | | is converted to open-ended | |
|---|---|---|---|---|---|---|
| | Before | After | Before | After | Before | After |
| | (1) | (1') | (2) | (2') | (3) | (3') |
| Treatment | 35,7 | 40,1 | 13,9 | 18,7 | 11,2 | 9,9 |
| Control | 48,8 | 53,6 | 21,4 | 25,6 | 15,8 | 15,4 |
| Differences (T - C) | -13,2 | -13,5 | -7,5 | -7,0 | -4,6 | -5,6 |
| Difference-in Differences | -0,3 | | 0,6 | | -1,0 | |

Source: *Quadros de Pessoal*, 2002-2007.

Notes: The before period considers 2002 and 2003 matches; the after period condiers 2004 and 2005 matches. Treatment firms have 11 to 20 workers and control firms 21 to 100 workers. Columns (1) and (1') show the probability of finding the same worker-firm match two years after the base year; Columns (2) and (2') show the probability of finding a worker employed on a fixed-term contract at the base year, that still works for the same firm on a fixed-term contract; Columns (3) and (3') show the probability of finding a worker employed on a fixed-term contract at the base year, that still works for the same firm now on an open-ended contract;

However, the unconditional difference-in-differences analysis may not be sufficient to capture the effects of the law change, as it is possible that there are other factors which affect the outcome and were not yet being considered. Insofar as these factors are observable, it is possible to include them as control variables in a conditional regression.

## 6.2 Conditional difference-in-differences

To obtain a clearer picture of how different firms have reacted to this reform, the set of firm characteristics presented on table 4 such as education, average tenure and average wage, combined with additional conditions to control for features as firm size

and age, are important explanatory factors for the use of fixed-term contracts as either a flexibility mechanism or as screening device.

To account for firm and workforce characteristics, for the treatment and control groups, I the before and after periods, I used a conditional difference-in-differences model:

$$y_{it} = Treat_{it} + After_{it} + After_{it}Treat_{it} + X_{it}\beta + \varepsilon_{it}$$

Where he dependent variable will be the share of fixed-term contracts in column (1), excess worker turnover for fixed-term contracts in column (2), excess worker turnover for open-ended contracts in column (3), excess worker turnover for all contracts in column (4), and the contract conversion rate in column (5). $Treat_{it}$ is a dummy variable for the treatment group, defined in each period t for all firms with 11 to 20 workers, $After_{it}$ is a dummy variable for the after period 2004-2008, and $After_{it}Treat_{it}$ identifies the impact of the policy change by assuming the value 1 for the treatment group in the after period. $X_{it}$ represents a set of characteristics by firm, as presented on table 4, among others listed on the notes for table 6. This regression uses fixed-effects estimators for it is assumed that firms have different policies regarding match reevaluations, which lead to different hiring, separation and contract conversion practices, even across firms that share similar characteristics.

From table 6 column (1), the share of fixed-term contracts is expected to be higher in the after period as table 5 suggests, treatment firm in the after period should also be higher when compared to the control group. The regression results confirm this, and the negative *treat* variable is also expected, since table 5 has shown a lower prevalence of fixed-term contracts among treated firms. Looking at the other independent variables, we find that the share of fixed-term contracts is negatively correlated to worker tenure, worker age, and base wage, and positively correlated to firm size. Expanding firms are expected to have higher shares of fixed-term contracts than contracting firms, and the services sector which includes seasonal activities, also tends to have higher shared of fixed-term contracts compared to manufacturing. This largely corresponds to the profile of firms that use fixed-term contracts as described by Portugal and Varejão (2010), and the effect of more stringent EPL on higher shares of

fixed-term contracts is predicted in the models of Bentolila et al. (2010) and Cahuc et al. (2012) provided there is substitutability between contracts which is reflected on higher excess worker turnover rates.

More stringent EPL should reduce excess worker turnover and create more stable employment relations, at least for the type of contract it protects. This is tested in column (3), where indeed EWT among open-ended contracts decreased for the treated firms in the after period, suggesting the policy change was efficient in this regard. However, and especially in two-tier labor markets, a one sided increase in EPL for one type of contract will have the opposite effect on the other. This is confirmed in column (2), where excess worker turnover increased for fixed-term contracts, in the treatment group, after 2004. As the overall excess worker turnover increased for treated firms after the policy changes, we can draw the conclusion that the policy change was ineffective in achieving higher job stability, as it may in fact have provided an incentive for firms to hire on fixed-term instead of open-ended contracts, and the higher shares of fixed-term contracts support this idea.

Lastly, column (5) reports the results for contract conversion rates. The after period shows a negative correlation, which was expected from table 5 as the number of surviving matches on open-ended contracts decreased. The treatment group also reports a negative correlation, as we have seen in table 5 the differences (T-C) were negative. What strikes as odd is the positive and relatively high correlation of the treatment group in the after period, as treated firms on aggregate have reported lower surviving matches on open-ended contracts in the after period. One possible explanation comes from the different estimation methods. On table 5 we have aggregate values, on table 6 we have a regression on individual firm's contract conversion rates. If we look at the distribution of CCR across treated firms, we find that in over 78% of all observations CCR is equal to zero. The firms engaging in contract conversions do not constitute a cohesive group either, and the decision to hire on a fixed-term contract and later convert to an open-ended contract appears to be idiosyncratic and circumstantial. What table 6 seems to indicate is that when observed individually, treated firms have not been deterred from converting fixed-term to open-ended contracts, and in fact exhibit higher conversion rates than the firms in the control group which have not been affected by the policy change.

The factors that increase the likelihood of a contract being converted are: firm size and firm age, with larger firms being more likely to convert contracts; firms with 3 to 5 years are more likely to convert contracts than younger and older firms; average worker tenure and average workforce age, with older and more experienced workers increasing the conversion chance; higher average wage, and higher education. These results are consistent with the findings by Portugal and Varejão (2010) regarding the use of fixed-term contracts as a screening device. Younger firms typically face more volatile environments, it is common to hire on fixed-term contracts to gain flexibility, and later convert to open-ended contracts. Higher average workforce tenure and age suggest that the firm's strategy relies on the worker's experience, and for that reason it is more likely to convert temporary to permanent contracts. Firms with higher human capital intensity, using average wage and education as proxies of human capital intensity, have higher conversion rates. The reasoning behind this behavior comes from the employer's hiring strategy, initially offering a fixed-term contract under the tacit or implicit agreement of converting to an open-ended contract if the match proves to be productive. This idea is consistent with Nagypál (2001) and Author (2001) on the process of using temporary contracts as a mechanism to learn about the match quality. Overall the results confirm both theoretical predictions and empirical studies on the use of fixed-term contracts as a screening device.

Table 6: Quasi-experimental evidence: Difference-in-Differences

| Treatment units | T:[11; 20] | | | | |
|---|---|---|---|---|---|
| Control units | C:[21; 100] | | | | |
| Dependent variables | SFTC | EFTC | EOEC | EWT | CCR |
| | (1) | (2) | (3) | (4) | (5) |
| After | 0,886 | 5,668 | 3,792 | 4,748 | -1,061 |
| | 0,152 | 0,535 | 0,331 | 0,328 | 0,482 |
| Treat | -0,906 | -0,680 | 0,016 | -0,409 | -3,837 |
| | 0,241 | 0,889 | 0,527 | 0,521 | 0,807 |
| After x Treat | 0,949 | 0,427 | -0,307 | 0,342 | 4,280 |
| | 0,202 | 0,757 | 0,441 | 0,437 | 0,687 |
| Control variables | - Yes, See notes - | | | | |
| Average of dependent variable | 26,2 | 36,1 | 21,6 | 31,8 | 16,7 |
| Number of firms | 48.877 | 35.023 | 46.318 | 48.877 | 48.877 |
| Number of observations | | | | | |
| Before | | | | | |
| Treatment | 14.033 | 8.770 | 13.781 | 14.033 | 8.770 |
| Control | 11.259 | 9.090 | 11.116 | 11.259 | 9.090 |
| After | | | | | |
| Treatment | 80.823 | 56.200 | 77.976 | 80.823 | 56.200 |
| Control | 64.978 | 54.752 | 63.394 | 64.978 | 54.752 |
| Total Total | 171.093 | 128.812 | 166.267 | 171.093 | 128.812 |

Source: *Quadros de Pessoal*, 2002-2008.

Notes: Standard errors are indicated below the parameter estimates. SFTC stands for the share of fixed-term contracts (in %); EFTC stands for excess worker turnover among fixed-term contracts (in %); EOEC stands for excess worker turnover among open-ended contracts (in %); EWT stands for excess worker turnover (in %) among all fixed-term contracts; CCR stands for contract conversion rate (in %) among fixed-term contracts. The before period corresponds to 2002-2003 and the after period to 2004-2008. For each period a tream firm has 11 to 20 workers and a control firm has 21 to 100 workers. The control variables included in the regression are: (i) log base wage; (ii) blue-collar workers (in %); (iii) Educational level, percentage of workers with: 9 or less years of college (10-12 year omitted); (iv) Females (in %); (v) Imigrants (in %); (vi) Log firm size (average number of workers); (vii) Firm age (in years) dummies: 2, 3, ..., 10 years, 11-15 yearsand 16-20 years (21 or more years omitted); (viii) Workforce average age (in years) dummies: 15-30, 31-40, and 41-45 (46 or more years omitted); (ix) Workforce average tenure (in months) dummies: 1-36, 37-60, and 61-120 (121 or more months omitted); (x) Expanding and contracting employment dummies (stable employment omitted); (xi) Manufacturing and utilities sector dummy; (xii) Commerce and services dummy.

### 6.3 Sensitivity analysis

The assignment of treatment and control groups has been so far on a period by period basis, meaning that the same firm can belong to different groups in different years. To test if different treatment assignments lead to different conclusions, I repeated the regression from chapter 6.2 for two cases: 1) treatment and control groups are defined once in the before period, and firms remain in the assigned groups in the after period; 2) only firms that never switched between groups are considered. The first case is presented on table 7 from columns (1) to (4), and the second case, also on table 7, from columns (5) to (8). The treatment parameter is omitted on both cases because these are fixed-effects estimators, and as firms never change between treatment and control groups the difference between groups is perfectly collinear.

Comparing table 6 results with columns (1) to (4) from table 7, when treatment and control groups are defined in the before period, the estimates for the share and excess worker turnover among fixed-term contracts are higher. As excess worker turnover among open-ended contracts is lower in the after period, the results seem to indicate that the policy change had a greater impact on transferring the costs from higher employment stability among open-ended contracts, to higher employment instability among temporary contracts, when only the firms from the before period are considered.

The results from columns (5) to (8), when compared to table 6, seem to have reacted less in terms of fixed-term contracts share and excess worker turnover, but on the other hand contract conversion rates are higher. As in this second group only firms that did not switch between groups are considered, this treatment assignment excludes many firms close to the fringes, from 17 to 23 workers on average, and which might have at some point passed from 17 to 21 workers, or from 22 to 20. Comparing the number of observation on table 6 and table 7, more than 40 thousand total observations fall in this category of firms that switched between groups. If a significant number of firms that registered job variation are excluded, it is expected that the remaining firms show lower excess worker turnover rates and higher reliance on contract conversions as their workforce is more stable.

A final consideration is to eliminate the firms close to size thresholds by redefining the treatment and the control groups. Firms with 18 to 25 workers were excluded from the before period, and firms with 10 to 11 workers were excluded from the after period. The treatment assignment method is period-by-period as in table 6, which allows for firms to move between groups. The results are similar to table 6 but the treatment effect is stronger, as the difference between both groups has increased by excluding fringe observations.

Redefining the selection criteria and reassigning firms into different treatment and control groups, or new treatment and control groups, did not alter the conclusions taken from chapter 6.2, and added new information. On the role of fixed-term contracts, higher rates of excess worker turnover among fixed-term contracts, which have been verified, indicate a greater use of fixed-term contracts as a mechanism to respond to shocks. On the other hand contract conversion rates indicate that firms use fixed-term contracts to find the best possible match, assigning workers to the most productive jobs. A decrease in this rate, as has been verified in the after period for most regressions and comes from an unobserved factor, has potentially negative consequences on productivity as the frequency at which better matches are found decreases. These regressions have shown is that the contract conversion policy of firms with 11 to 20 workers does not seem to have been particularly affected by the increase in EPL. On the other hand, the group with 21 to 100 workers seems to have been affected by a factor not predicted in the model, and may constitute an object for future research.

Table 7: Quasi-experimental evidence: Treatment assignment alternatives

| Treatment assignment | In 'before' period | | | | Always the same | | | | Period-by-period | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Treatment units | T:[11; 20] | | | | T:[11; 20] | | | | T:[13; 17] | | | |
| Control units | C:[21; 100] | | | | C:[21; 100] | | | | C:[26; 100] | | | |
| Dependent variables | SFTC | EFTC | EOEC | CCR | SFTC | EFTC | EOEC | CCR | SFTC | EFTC | EOEC | CCR |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| After | 1,713 | 6,462 | 2,618 | 0,018 | 0,398 | 5,153 | 2,421 | -0,687 | 0,851 | 5,296 | 2,601 | -0,827 |
| | 0,153 | 0,529 | 0,330 | 0,477 | 0,164 | 0,603 | 0,376 | 0,555 | 0,168 | 0,586 | 0,369 | 0,531 |
| Treat | . | . | . | . | . | . | . | . | -1,206 | -1,716 | -0,650 | -4,242 |
| | . | . | . | . | . | . | . | . | 0,294 | 1,083 | 0,651 | 0,981 |
| After x Treat | 1,303 | 0,743 | 0,105 | 3,909 | 1,283 | 0,358 | 0,414 | 6,152 | 1,166 | 1,105 | 0,120 | 4,055 |
| | 0,197 | 0,721 | 0,426 | 0,651 | 0,221 | 0,883 | 0,507 | 0,814 | 0,236 | 0,886 | 0,521 | 0,803 |
| Control variables | - Yes. See Table 6 - | | | | | | | | | | | |
| Average of dependent variable | 22,5 | 36,3 | 21,8 | 17,8 | 25,3 | 35,4 | 20,9 | 16,8 | 26,4 | 37,0 | 21,8 | 16,7 |
| Number of observations | 172.260 | 105.659 | 147.780 | 104.189 | 127.199 | 94.320 | 122.860 | 100.115 | 139.469 | 107.206 | 134.867 | 113.398 |

Source: *Quadros de Pessoal*, 2002-2008.

Notes: Standard errors are indicated below the fixed-effects estimates. SFTC stands for the share of fixed-term contracts (in %); EFTC and EOECstand for excess worker turnover among workers on, respectively, fixed-term contracts and open-ended contract (in %). In columns (1) to (4) the treatment and control status are defined in the before period and kept the same each year throughout the after period regardless of the firm size. In columns (5) to (8) only firms wich never changed treatment status during the entire sampling period, i.e., it excludes movers by considering treatment firms that always had 11 to 20 workers and similarly control firms that always had 21 to 100 workers. In columns (9) to (12) firms that clustered around the size tresholds are eliminated from the sample. In particular, in the before period, firms with 18 to 25 workers are excluded and, in the after period, firms with 11 or 12 workers are also excluded; treatment status is defined for each period.

# 7 Conclusion

Asymmetric institutional reforms provide unique opportunities to study the closest equivalent to a natural experiment in economics. In the case of two-tier labor markets, where the relation between workers with permanent and temporary contracts is already asymmetric, any reform targeted at one specific subset of workers or firms is particularly interesting, as it is possible to isolate and measure its effects. In addition, the role of fixed-term contracts, either as a screening device or as a flexibility mechanism with high turnover rates, has important implications for long term economic productivity.

For these reasons the goal of this dissertation was to find the impact of an asymmetric institutional reform on the use of fixed-term contract as a screening device. Following the methodology used by Centeno and Novo (2012) to study the impact of the 2004 labor code reform on excess worker turnover and fixed-term contracts, I confirmed that the increase in employment protection legislation over open-ended contracts has increased job stability for workers on this type contract, at the cost of higher instability for workers on fixed term contracts. Firms have reacted to the reform by increasing the share of workers under fixed-term contracts, which supports the idea of a high degree of substitutability between both contracts types.

Regarding the use of fixed-term contracts as a screening device, I found that at the aggregate level the firms directly affected by the reform seem to have decreased the contract conversion rate, although when taking into account firm level characteristics using a conditional difference-in-differences model, the effect seems to be reversed. While the use of fixed-term contracts as a screening device seems to be adopted as a regular policy in medium to large firms, in smaller firms their use seems to be heavily influenced by idiosyncratic motives. The increase in excess worker turnover was accompanied by an increase in the contract conversion rates within the group of affected firms, which is justified given the level of heterogeneity among firms. As the decrease in contract conversion rates affected all firms after the reforms, in particular firms not targeted by the increase in EPL, there might be a factor not accounted for in this model which may justify further research.

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